Developing a Techno-Selective Framework for Analyzing the Implementation of Emerging Technologies

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On my honor as a University Student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments

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Introduction

> *"Technology is an outcome of particular decisions that favor one way of life over another" (Johnson-Weiner, 2014, p. 21).*

In a world where the continuous stream of advertisements about the latest gadget or technology seems incessant, we have become accustomed to new technologies emerging every day. These new technologies have offered a plethora of modern conveniences and benefits to individuals into today's society that those who came before us were never able to experience—even leading to an 10-year increase in the average life expectancy since 1950 (Center for Disease Control and Prevention, 2016). However, the technologies of the modern world have come at a significant cost, as we have experienced a myriad of negative impacts and unforeseen consequences affecting our planet, individuals, and society as a whole. And while we know the increase of emerging technologies is leading to a rise in the number of negative impacts due to these technologies, there is still significant uncertainty surrounding how to stop these unwanted consequences of new technologies from growing out of control. This is due to the fact that although we acknowledge that technological progression is becoming entirely unmanageable, we have had no success in regaining any sort of influence over its progression. If we continue to rely on our current understanding of the problem — which is inadequate and incapable of generating solutions — these new technologies will continue to progress uncontrollably and cause further harm to our planet and our lives. Therefore, we must adopt a "techno-selective" framework to achieve a greater understanding of the progression of technology in light of societal goals and values as well as utilize this framework to make decisions regarding whether or not an emerging technology should be implemented into society, and to what extent. In order to develop this techno-selective framework, the origins and primary utilization of the term to describe the Amish

approach toward new technologies is discussed in detail. After considering how the term has been used in the past, this paper provides a methodology for both innovators and regulators to begin implementing a techno-selective approach towards technology.

Part I: Society is Unable to Selectively Manage the Progression of Technology

With new innovations emerging every day, technology is progressing rapidly and bringing significant societal change along with this progression. Yet despite this rapid progression, we do not seem to have the proper means to selectively manage the technology. In the preface to his book, *Technological Change: Its Impact on Man and Society*, Emmanuel Mesthene claims that modern technologies "serve to bring about changes in institutions and individual lifestyles; they generate strains for our values and beliefs; and they create problems—and opportunities—for our economic and political organizations" (1970, p. v). And because of its substantial influence on society, we know that the progression of modern technology must be kept in check. However, technology seems to be progressing so quickly that we are not able to properly manage it. Thus, the questions are raised: why are we unable to selectively manage technology, and what are the contributing factors to this issue?

While there are a variety of reasons as to why human oversight over the rapid influx of new technology seems to be unmanageable, I discuss two significant factors for this loss of oversight and control. First, among engineers, too much emphasis is often placed on finding a technical solution to a problem, thus reducing the emphasis on engineers considering the ethical, social, and moral implications of their technology. Additionally, with such a wide variety of attitudes toward technology, it is difficult to come to a consensus about how exactly technology should be viewed and defined; therefore, it is difficult to develop a solution on how to regain influence over technology.

Overemphasis on Technical Problem Solving

The first factor contributing to our inability to selectively manage technology is the commonly held misconception that an engineer is merely a technical problem solver. While engineers should be involved with developing technical solutions to problems, the emphasis of an engineering education often lies too heavily on solving a problem rather than defining it. To understand this concept in more detail, one should consider G. Downey's keynote lecture *Are Engineers Losing Control of Technology: From 'Problem Solving' to 'Problem Definition and Solution' in Engineering Education* (2005). In this lecture, Downey argues that engineers are losing control of technology because we are putting technical problem solving at the core of our engineering education. He begins his discussion by expressing the concern that the current state of rapid technological change seems to be quickly slipping out of the grasp and control of engineers. Downey raises the questions:

> Might it be the case that rapid technological change is posing a fundamental challenge to engineering in general? Could it be revealing an inherent vulnerability in the disciplinary identities of engineering fields, namely their claimed identification with technological development? Might engineers no longer be able to legitimize their fields easily and wholly in terms of contributions to technological innovation? Put most bluntly, are engineers losing control of technology? (Downey, 2005, p. 584).

Downey, through using these questions to create a sense of urgency, is clearly considering the issue of unchecked technological progression to be of paramount importance. But what is causing this loss of control? When considering the "far-reaching implications" of these questions, Downey states that "the strong core emphasis in fields of engineering on technological development and technical problem solving" plays a role in engineers' gradual loss of control

over technology (2005, p. 584). An evidence-based discussion on "the engineer as technical problem solver" follows, as Downey outlines the various approaches of engineering education for several countries around the world. After providing a brief overview for each nation's struggles with technology, he claims these set of cases call attention to a "distinctive commonality in the engineering commitment to technological change and focus on technical problem solving," and concludes that "in each case engineers have measured there contributions primarily through technologies and defined their education as technical preparation for technological innovation" (Downey, 2005, p. 585). From Downey's analysis of the current focus of engineering education programs around the world, we are able to gain some insight as to why we are unable to selectively manage technology. While engineers should solve problems, the view that an engineer's only role is to solve a technical problem which is given to him or her is limiting their full potential and responsibility as an engineer. Too much emphasis on solving a technical problem results in engineers putting all their effort into developing more and more technologies, thus leaving no time for the engineer to consider the potential negative implications of these technologies or whether these technologies are truly needed, and even whether or not he or she even solved the correct problem to begin with.

Conflicting Attitudes toward Technological Progress

Furthermore, a proliferation of differing attitudes toward the progress of technology in our world have contributed to our inability to selectively manage technology. Ranging from entirely enthusiastic views about the benefits technology can offer us to pessimistic views regarding the detriments of technology—and everything in between—it is difficult to come to a consensus about technologies' role in our lives. In their article, *A Framework of Attitudes toward Technology in Theory and Practice*, Christian Kerschner and Melf-Hinrich Ehlers discuss and

organize various researcher attitudes toward technology into four major categories: Enthusiasm, Determinism, Romanticism, and Skepticism (2016). Within these four categories, Kerschner and Ehlers break down each general techno-attitude into three subcategories as shown in Figure 1.

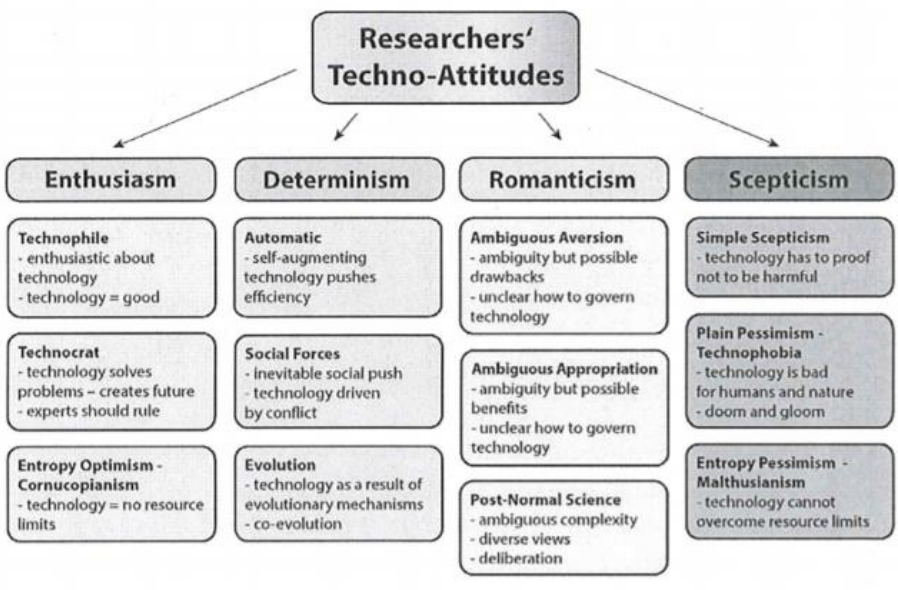

Figure 1. A framework of a spectrum of attitudes toward technology (Kerschner & Ehlers, 2016).

As evidenced by the 12 separate categories of techno-attitudes, which Kerschner and Ehlers identified through examining a 17 technology-related lectures, one can conclude that a great diversity of attitudes toward technology exist, even among scholars. Mesthene also identifies this diversity of techno-attitudes in *Technological Change* when he identifies and analyzes optimistic, pessimistic, and indifferent views toward technology and the current state of its progression (1970). While it is natural for humans to hold differing views on a specific issue, this lack of consensus is a major contribution to the problem of our proper management of technology. If researchers' cannot at least come to a common understanding of the problems with technology, then we cannot expect to establish any sort of goal-oriented management of technology, as we will each be working to solve a different problem. Therefore, we can conclude

the diversity of conflicting techno-attitudes which exist in our society today directly contributes to our inability to selectively manage technology.

Part II: The Amish Approach Provides Us with a New Way of Viewing Technology

With the aforementioned diversity of attitudes toward technology in mind, finding a sense of cohesion and coherence about how we can progress forward technologically can seem at first glance to be a daunting task. Thus, to regain the ability to provide direction for the course of technology, we must develop a new framework for which we view technology — a techno-selective framework. The concept of techno-selectivity is a rather underdeveloped thought process and has yet to be an influential factor in engineering decision making, but nonetheless, has the potential to be a useful framework for considering the implementation of new technologies. But in order for us to understand the idea, rationale, and implementation of the techno-selective framework, we must first analyze the context in which it has been utilized over the years.

While the concept of techno-selectivity is a relatively new term and has only been used in a small number of published works, the principles of the term have been well-demonstrated by one specific community of people—the Amish. Dressed in handmade plain clothes and limited to horse-drawn vehicles and farm machinery, the Amish are often thought to be opposed to all forms of modern technology. However, the Amish utilize a variety of modern technologies such as farming equipment, milling machinery, and (propane-powered) refrigerators. While this combination may seem self-contradictory to many, there is an intricate and complex reasoning behind the Amish communities' techno-selectivity. Howard Rheingold discusses this techno-selective nature of the Amish in his article *Look Who's Talking* (1999). Rheingold claims that, "Far from knee-jerk technophobes, [the Amish] are very adaptive techno-selectives who devise

remarkable technologies that fit within their self-imposed limits" (1999, p. 2). The Amish do not despise technology as many believe, rather they make a deliberate decision whether to permit or reject each new technology based on how it will affect their community as a whole. When a new technology is introduced to the Amish community, it is not forbidden outright, but rather evaluated by the leaders, or bishops, of the Amish community to determine the positive or negative effects it will have on the local community. To inform their decisions about whether or not a new technology should be permitted, the bishops will often ask the question, "Does it bring us together, or draw us apart?" (Rheingold, 1999, p. 3). By asking this question, the bishops hope to determine the positive or negative implications of the new technology in order to come to a conclusion about whether or not the technology will be allowed in their community.

However, the techno-selective process is not merely as simple as acceptance or complete rejection of the technology in question. Rheingold claims the Amish communities use of a select few technologies—while rejecting many other technological innovations—could be called "sophisticated, because the Amish have an elaborate system by which they evaluate the tools they use; their tentative, at times reluctant use of technology is more complex than a simple rejection or a whole-hearted embrace" (1999, p. 1). This sophisticated system allows for a gradient of possible outcomes when evaluating a new technology. While Western views on technology often dictate that a technology is either bad or good, the techno-selective approach of the Amish is not nearly as black and white. As illustrated by the decision tree I created in Figure 2, the Amish techno-selective approach toward new technology is much more nuanced then the traditional viewpoint. Rather than a technology being immediately rejected if it fails to meet community values, the Amish techno-selective approach contains several strategies for implementing the technology, which is shown on the rightmost side of the tree. These Amish

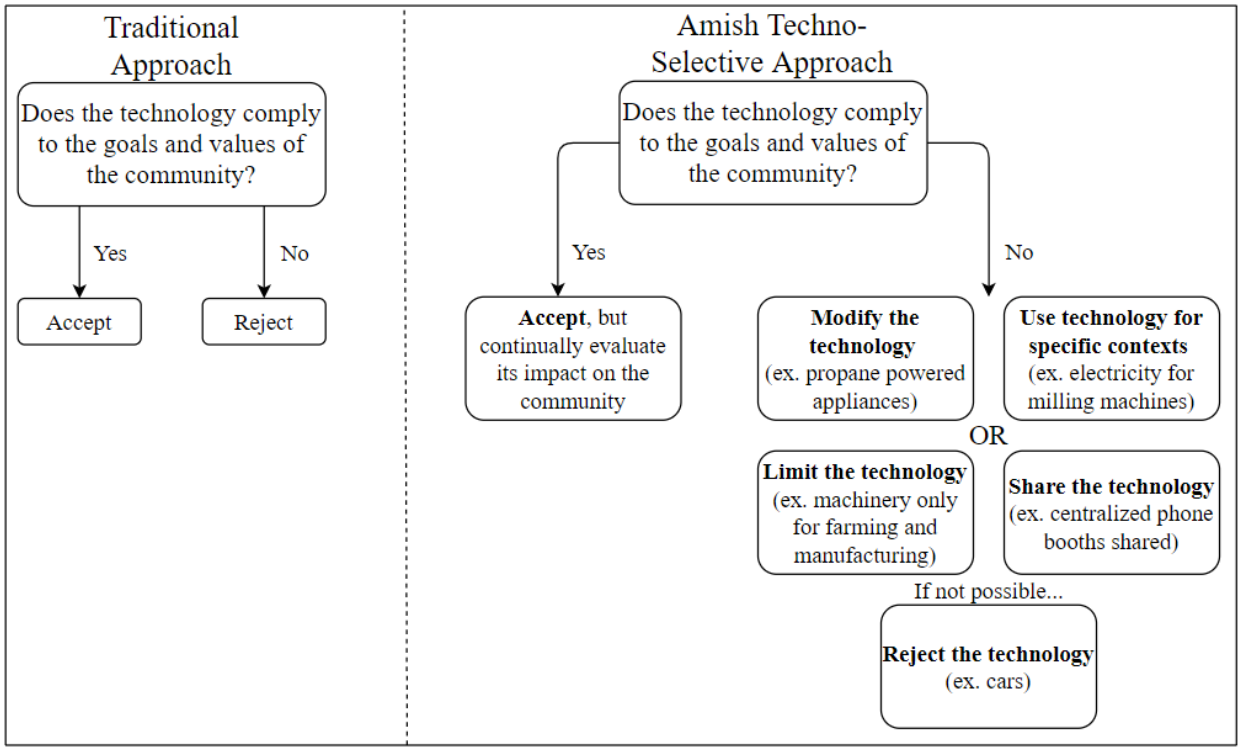

Figure 2. Amish vs. Non-Amish approaches toward implementing a new technology (created by author).

strategies for repurposing or reimagining the technology in question include utilizing the technology only in specific contexts, modifying or limiting the technology, or sharing a technology among community members in order to limit their access to it. Additionally, even if a technology is initially determined to comply with the values of the community, its effects on the community may still be monitored to determine if will create unwanted behavior after a longer period of time. Thus, compared to the traditional non-Amish approach towards viewing technology, the more nuanced techno-selective approach of the Amish allows them to simultaneously be critical about what technologies they permit and still leave opportunities to reimagine and repurpose technologies to fit within their community goals and values.

A Deeper Understanding of the Amish Approach

In order to truly understand the Amish communities' techno-selective approach of permitting or rejecting new technologies, we must have an understanding of their mindset and

perspective of technology as a whole. In her essay, *Technological Diversity and Cultural Change among the Amish,* Karen M. Johnson-Weiner analyzes these underlying attitudes held by the Amish toward technology (2014). She claims, "Technology itself is not a threat to the Amish. Rather, technology is an outcome of particular decisions that favor one way of life over another" (Johnson-Weiner, 2014, p. 21). Compared with the tendency of Western culture to regard technology with either an unbridled enthusiasm or as a threatening entity that cannot be controlled, the Amish view of technology is drastically different. The Amish neither worship nor feel threatened by technology; rather, they are aware of their ability to actively exercise control over technology by making decisions about permitting a particular technology. And through their continuous evaluation of new technologies and their selectiveness in permitting them, the Amish have the ability to directly limit and control the influence of technology on their lives.

Furthermore, in order to fully understand the techno-selective framework, we must understand the Amish communities' attitude toward the social and cultural changes that are inherent consequences of technological progression. Through her interviews with several members of the Amish community in *Technological Diversity and Cultural Change*, Johnson-Weiner is able to provide insight into the Amish perspective of cultural change within their techno-selective framework (2014). In one of these interviews, she discusses the technological diversity among Amish communities in different counties with a bishop. The bishop states, "We all change. It's how that's important" (Johnson-Weiner, 2014, p. 21). Thus, we can see the Amish are willing to accept change; however, there is significant concern regarding how exactly they are changing. Once again, when compared to Western culture, the Amish community provides a significantly different viewpoint. This difference in viewpoints is partially due to the fact that many non-Amish Americans are often indifferent to the ways that technology is leading

to social change. In contrast, the Amish strive to be cognizant of how social change is occurring in their community due to the progression of technology. And with this acute knowledge of the course of social change in their community, they can utilize their techno-selective framework to help regulate the change.

When compared with non-Amish American attitudes toward technology, the Amish perspective can seem like a radical approach toward implementing technology that we may never be able to achieve. However, the starting point begins with changing our view of technology. Rather than feeling threatened by technology, we should carefully consider the change that technology brings about. With this knowledge, we can then begin implementing the techno-selective framework allowing us to regulate technological progression and exercise some control over technology, rather than technology exercising control over us.

Part III: A Techno-Selective Mindset Provides a Greater Understanding of the Problem

While it is clear that we are currently unable to selectively manage the progression of technology, the larger issue at stake is our society's inadequate mindset regarding technology that hinders us from working toward effective solutions. And while curbing the problem of an uncontrollable technological take-over cannot be solved in a single research paper, I argue that viewing emerging technologies within a techno-selective framework helps to give us a better understanding of how to approach the problem. Through the process of researching the drivers of our technology problem as well as the origins and implications of a techno-selective framework, I have to come to a few key discoveries that help develop our understanding of the problem that were not obvious at the outset of my research.

From observing the Amish approach to technology and comparing it to the traditional western views, I have discovered that we as a society have subscribed to an over-simplistic and

often inaccurate view toward new technologies — a dichotomy of either full-fledged acceptance or complete rejection of the particular technology in question based on whether or not the initial concept complies to our ethical standards and societal goals. As evidenced by the aforementioned techno-attitudes of various researchers and intellectuals, there is a clear tendency to reduce our views of emerging technology to a simple black and white spectrum—judging the technology to be inherently good or bad—with no capacity for adaptation. We limit this new technology to one of two possible outcomes: either it complies with our societal goals and values and should be accepted, or it does not comply, and should be rejected. However, this dichotomy of technological outcomes leads to a variety of negative consequences. First, it can lead to the outright rejection of an idea that—with proper modifications, adjustments or repurposing—had potential to become a viable technology. Additionally, if an innovator or engineer develops a technology that has the potential to threaten accepted societal goals and values, he or she may tempted to ignore these implications due to monetary and performance-driven pressures to get their technology on the market, resulting in future consequences down the road.

A techno-selective approach, however, provides potential solutions to both of these issues. Instead of viewing a new technology as an absolute failure if it threatens a specific societal value or goal, a techno-selective approach asks the question, "How can I better understand the actual problem I am trying to solve in the context of societal goals and values in order to make necessary adjustments to my technology?" After these necessary adjustments have been made based on the revised problem definition, the technology now provides a better solution that accounts for societal values. Furthermore, the techno-selective framework can help relieve the temptation of an innovator to cut corners or ignore societal considerations out a fear that the effort put into developing their technology has gone to waste. Rather than moving

forward with the current flawed design and ignoring the adverse implications, the techno-selective innovator asks questions such as, “How can this technology be modified to comply

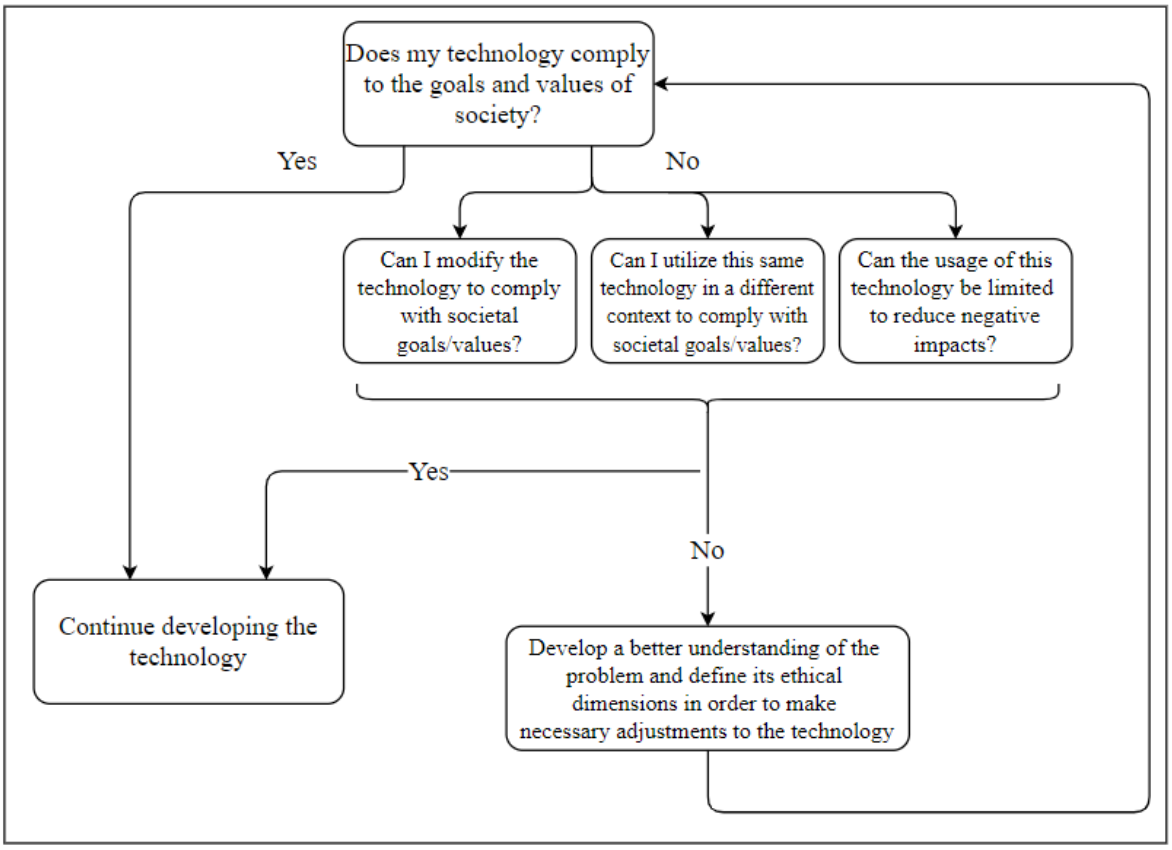

Figure 3. Applying the techno-selective methodology from the innovators perspective (created by author).

with societal goals and values?” and “Are their specific contexts in which this technology can be used that will not lead to negative impacts?” By asking these questions, the engineer or innovator will be able to both address the societal value concerns raised by their initial idea as well as effectively move forward with their technology. This utilization of the techno-selective framework by an innovator is illustrated in Figure 3. This flow chart demonstrates the step-by-step process that innovators can take to walk through the techno-selective process in the context of their own problem. In conclusion, we must realize that the utilization of the techno-selective approach should not just be limited to those who want to regulate technologies’ progression, but

rather utilized by innovators themselves because of the benefits that arise from viewing their problem through the lens of techno-selective framework.

Conclusion

The problem of our gradual loss of control over technology is a significant issue that requires our immediate attention. However, while it is clear that we are currently unable to selectively manage technology, the larger issue at stake is our society's inadequate mindset regarding technology that hinders us from working toward effective solutions. Differing attitudes toward technology have left unsure of how to even begin the process of addressing the many issues required alleviate the problem. Thus, to start working toward potential solutions, we must set aside our individual mindsets and come to greater understanding of the problem as a society. Rather than viewing technology as threatening force that cannot be stopped and desperately trying to regain control, we must realize that with a proper viewpoint, some degree of goal-oriented management can be regained over the course of technological progress.

In order to do this, we must first give up our binary view of emerging technologies—that either it complies with societal values and should be accepted, or it does not comply and should be rejected—and take a more nuanced approach. This can be done by replacing our current binary approach for implementing new technologies with a techno-selective methodology, thus helping us to exercise some degree of selective management over the progression of technology. While it will not be possible to solve all of these issues overnight, if our society can achieve a better understanding of how to view the problem through a techno-selective framework, we will be one step closer toward regaining some control over the progress of technology.

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